REMARKS

Summary of the Office Action

In the November 9, 2011 non-final Office Action, Claim 13 stands rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite;

Claims 1-10, 14 and 15 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Naoki et al. (Japanese Pat. Pub. No. JP 2004-001076) (hereinafter "Naoki") in view of Chin et al. (U.S. Pat. No. 7,005,317) (hereinafter "Chin"); and

Claims 11-13 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Naoki and Chin in further view of Fukuyo (European Pat. No. EP 1 338 371) (hereinafter "Fukuyo").

Information Disclosure Statement

Applicants appreciate the Office's acknowledgement of the Information Disclosure Statements submitted November 22, 2010 and July 27, 2011.

Summary of the Response to the Office Action

In the present case, Claims 1-19 are pending, with Claims 16-19 withdrawn from consideration based on a Restriction Requirement of November 5, 2009. The present Amendment amends Claims 1 and 12-13 without introducing any new matter.

Rejection under 35 U.S.C. § 112, Second Paragraph

Claim 13 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In response, Applicants herewith amend Claim 13 to recite that the value range 1.3 to 3.3 represents a *ratio* of the energy of the laser light for forming the first modified regions, as compared to the energy of the laser light for forming the second modified region. Because Applicants' dependent Claim 12 has similar language, this claim is also amended to differently recite this feature. Also, these features find non-limiting support in Applicants' disclosure as originally filed, for example in the originally filed English specification at page 6, paragraph [0016]. No new matter has been added. Accordingly, Applicants respectfully request withdrawal of the rejection under 35 U.S.C. § 112, second paragraph.

Rejections under 35 U.S.C. § 103(a)

Claims 1-10 and 14-15 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Naoki in view of Chin, and dependent Claims 11-13 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Naoki and Chin in further view of Fukuyo. Applicants respectfully traverse the rejection, and request reconsideration thereof, as next discussed.

Applicants herewith amend independent Claim 1 to recite "generating a fracture extending along the cutting line from the second modified region to the rear face such that the fracture does not reach the front face of the substrate." This feature finds non-limiting support in

Figures 16, 17, and 18(a) and at page 27, paragraph [0058], showing a substrate 4 having front face 3 and rear face 21, and a fracture 24 that reaches the rear face 21 of substrate 4, but not the front face 3. Moreover, Applicants' independent Claim 1 is also amended to recite "expanding an expandable film bonded to the rear face of the substrate in a direction that is parallel to the rear face of the substrate." This feature finds non-limiting support in Figures 18(b) and at page 28, paragraph [0060], discussing features with respect to the expandable tape 23. No new matter has been added.

Briefly summarizing, Applicants' independent Claim 1 is directed to a laser processing method of irradiating a substrate having a front face formed with a laminate part including a plurality of functional devices with laser light while locating a light-converging point of the laser light within the substrate so as to form a modified region which functions as a start point for cutting within the substrate along a cutting line of the substrate. The method includes the steps of a first forming step of forming a plurality of rows of first modified regions along the cutting line; a second forming step of forming at least one row of a second modified region along the cutting line at a position between the first modified region closest to a rear face of the substrate and the rear face; as a result of the second forming step, generating a fracture extending along the cutting line from the second modified region to the rear face such that the fracture does not reach the front face of the substrate; expanding an expandable film bonded to the rear face of the substrate in a direction that is parallel to the rear face of the substrate; and as a result of the expanding step, cutting the substrate and the laminate part along the cutting line by advancing the fracture from the substrate to the laminate part by way of the first modified regions.

Turning now to the applied references, Naoki is directed to a method of cutting an wafer 1a having a laminated structure including a substrate 15 by using a laser beam L, by forming a melted domain 13 by multi-photon absorption by irradiating the substrate 15 with a focal point P of laser L inside the substrate 15 along a cutting line 5. Abst., Figs. 20a-c, ¶ [0056]. Naoki explains with respect to his Figures 20a-c and 21a-c that a crack 18 is grown from the melted area 13 into the thickness direction of the substrate 15, so that the wafer 1a can be separated. Figs. 21a-c, ¶ [0065]. In particular, in Naoki, a knife edge 33 is applied at the expandable tape 23 on the rear face 21 of the wafer 1a, to apply mechanical bending stress to the wafer 1a. *Id.* As further shown in Naoki's Figures 21a-c and in Figure 22, the crack 18 reaches both the rear face 21 and the upper face of substrate 15, because the insulating layers 17a and 17b are also cracked up to surface 3. *Id.* Accordingly, Naoki fails to teach a method including a step of generating a fracture extending along the cutting line from the second modified region to the rear face such that the fracture does not reach the front face of the substrate, such as required by Applicants' independent Claim 1.

The reference Chin, used by the pending Office Action to form the 35 U.S.C. § 103(a) rejection, fails to remedy the deficiencies of Naoki, even if we assume strictly *arguendo* that these reference can be combined.

Chin is directed to a method for separating dice 2 from a substrate 1, by pre-cutting and bending the substrate 1 with dice 2 with a flexible and bendable diaphragm 20. Abst., Fig. 13. Chin explains that diaphragm 20 is mounted on the side of the substrate 1 that is opposite to the side where grooves 18 are formed. Col. 4: 6-28, Figs. 6-7. In particular, Chin states "[t]he bowing of the diaphragm 20 creates a predetermined bending stress at the groove base 23 as the

dice 2 are influenced to move in different directions by the fluid pressure. The bending stress is sufficient to cause fracture initiation at the groove base 23 and subsequent fracture 19 through the thickness of the substrate 1 along the grooves 18." Col. 4: 39-42. As shown in Figures 8-9, the fracture that is formed by the bent diaphragm 20 extend through the entire substrate 1 from the groove base 23 to the diaphragm 20. Accordingly, Chin fails to teach a method including a step of generating a fracture extending along the cutting line from the second modified region to the rear face such that the fracture does not reach the front face of the substrate, such as required by Applicants' independent Claim 1.

Accordingly, Applicants respectfully traverse the rejection under U.S.C. § 103(a) over the combination of the reference Naoki and Chin, because the combination, even if assumed to be proper, fails to teach all the features of Applicants' independent Claim 1.

Moreover, Applicants also respectfully traverse the rejection of dependent Claim 10. Dependent Claim 10 requires that the light-converging point of the laser light is located at a position distanced by 20 μm to 110 μm from the rear face when forming the second modified region. As discussed in Applicants' specification with non-limiting examples, the specific location of the light-converging point P of the laser light L inside the substrate 4 as described in Applicants' Claim 10 allows to reliably grow fractures starting from the second modified region to reach the rear surface 21 of the substrate 4. In a case where the distance to the rear face is less than 20 μm, damages to the rear surface 21 could occur, for example by melting the surface 21. On the other hand, when the distance to the rear face exceeds 110 μm, fractures that originate from the second modified region are unlikely to reach the rear face 21 of the substrate 4. See e.g. spec., ¶¶ [0015]-[0016]. Please note that this discussion regarding the features of Applicants'

dependent Claim 10 is provided for explanatory purposes only, and shall not be used to limit the scope in any fashion.

The November 9, 2011 Office Action rejected these features as being obvious for one of ordinary skill in the art, merely because Naoki teaches the cutting of a substrate 15 with a thickness of 100 μm. However, in light of the above comments with respect to the features of dependent Claim 10 describing substantial advantages of the prior art cutting methods, it is believed that these features are not obvious, and the rejection of dependent Claim 10 under 35 U.S.C. § 103(a) is respectfully traversed.

CONCLUSION

In view of the foregoing, Applicants submit that the pending claims are in condition for allowance, and respectfully request reconsideration and timely allowance of the pending claims. Should the Examiner feel that there are any issues outstanding after consideration of this response; the Examiner is invited to contact Applicants' undersigned representative to expedite prosecution. A favorable action is awaited.

EXCEPT for issue fees payable under 37 C.F.R. § 1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. § 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account No. 50-0573. This paragraph is intended to be a CONSTRUCTIVE PETITION FOR EXTENSION OF TIME in accordance with 37 C.F.R. § 1.136(a)(3).

Dated: April 9, 2012

Respectfully submitted,

By: /Nikolaus P. Schibli/

Nikolaus P. Schibli
Registration No.: 56,994
DRINKER BIDDLE & REATH LLP
1500 K Street, N.W.
Suite 1100
Washington, DC 20005-1209
202.842.8800
202.842.8465 (Fax)
Attorneys/Agents For Applicants